

Department of Industry, Science, Energy and Resources  
Industry House  
10 Binara Street  
Canberra ACT 2600

19 June 2020

Dear Technology Investment Roadmap team,

**Re: Submission in response to the Technology Investment Roadmap discussion paper**

Thank you for the opportunity to provide a response to the Technology Investment Roadmap discussion paper (May 2020). Engineers Australia is the peak body of the engineering profession. It is a professional association with about 100,000 individual members. Established in 1919, Engineers Australia is a not-for-profit organisation, constituted by Royal Charter to advance the science and practice of engineering for the benefit of the community.

Engineers Australia supports the overarching technology investment goals set out in the discussion paper, including the intent to accelerate the decarbonisation of Australia's energy sector. Our principal observation is that the success of the proposed roadmap hinges on the deployment of new, commercially feasible low emissions technologies and the novel integration of these technologies into Australia's power systems (at the different scales).

The roadmap is framed as a strategy for delivering point solutions, that is, solving isolated challenges without regard to the whole-of-system context. It canvases opportunities for bringing down the cost of new technologies and assumes that market forces will drive wide scale adoption. Engineers Australia's view is that this approach will be difficult to deliver efficiently without a concurrent and conscious commitment to addressing engineering challenges and capability requirements.

The core engineering issues are at two levels: systems integration and technology development.

- **Systems integration.** Adding new devices (at scale) into the power system can be expected to trigger material changes in the power system control philosophy. The magnitude of this challenge should not be underestimated, as is evidenced by the large body of work currently required to plan for a high penetration renewables future. If the intent is to further accelerate the uptake of new grid-connected technologies, a dedicated mechanism is needed to quickly and efficiently deal with technical barriers to market acceptance.
- **Technology development and deployment.** Engineering challenges associated with deploying new technologies will inevitably be encountered. It is critical that we have the capacity to identify these issues systematically. Having a clear and early understanding of the nature of the engineering issues involved reduces the need to fund multiple projects that solve the same problem. Moreover, systematic tracking of engineering solutions provides the means to ensure the profession quickly integrates this knowledge into the science and practice of engineering. This is particularly relevant for growing the pool of expertise available to businesses adopting these new technologies.

To address these matters, Engineers Australia recommends two initiatives be integrated into the roadmap.

**Power and energy technical authority.** Developing and implementing technical solutions is a structural feature of the investment task across the spectrum. Technologies at Technology Readiness Levels (TRL) 6 and beyond are fundamentally seeking to address first of a kind engineering issues (paired with the development of commercial business propositions and product offerings). Early stage Commercial Readiness Index (CRI) technologies progress by setting and refining a performance track record: a major component of this is the engineering learning-by-doing across multiple deployments. Late stage CRI technologies, where the focus is on scaled deployment, give rise to knock on system integration challenges. The technical connection 'shock' that followed the speedy deployment of large-scale solar photovoltaics (PV) (and big batteries) is a case in point.

To be successful the technology investment strategy requires access to an independent and systematic source of technical advice on power and energy innovation matters. Engineers Australia sees significant value in establishing a distinct authority with a mandate to provide such advice.

As above, assessing engineering challenges for new technologies is a function that spans the full innovation pathway. It is currently performed in different ways by funding bodies (Australian Renewable Energy Agency, Clean Energy Finance Corporation, etc), researchers (including CSIRO), the Australian Energy Market Operator and others. These individual efforts do not provide systematic visibility of the skills and competencies applied to making technical judgements. Moreover, they do not provide a centralised ability to assess and coordinate engineering innovation priorities across the investment spectrum. This is required work and it is recommended that it be elevated to form part of the governance framework for any future program of investment in new technologies.

It is noted that bodies established to support the roadmap are the Ministerial Reference Panel and a technical review process. These provisions are distinct from the proposal for an independent technical authority. The latter is focused on providing a dedicated source of trusted advice on implementation challenges arising in the course technology investment (but necessarily intersects with the policy design task of the former).

**Systematic capability development.** Investment in projects across the TRL and CRI spectrum generates knowledge that, without careful management, is held for use and application by the project owners only. This is appropriate in some circumstances, such as the underwriting of risk for scaled deployments of a near bankable asset class: i.e. projects between CRI 4-6.

Outside of this range, a conscious application of policy tools to share value is needed to ensure efficiency of government investment. Accordingly, we recommend that strategies for leveraging information gained through projects to accelerate the uptake and adoption of new technologies are incorporated into the design of the roadmap architecture.

Creating value by leveraging project insights and information is a specialist capacity. It requires the design of systems that manage commercial sensitivities, stakeholder relationships, data management and analysis. We have avoided the use of the term 'knowledge sharing' because it removes the sense that the activity proposed is an active and distinct policy tool available to government that is focused on delivering targeted education and behavioural change.

Finally, it is recommended that more attention is paid to how the effects of technology investments are assessed. The metrics chosen to assess the effect of government investments are both financial metrics. This is appropriate, but a concurrent priority is to understand changes in overall system resilience associated with disruption or structural change brought on by new technology deployments. It is not clear if the plan is to design system solutions that improve efficiency, safety and resilience. These are not addressed by output measures such as those proposed in the discussion paper. If the intention is to handle those broader outcome measures separately then a clear articulation of roles and responsibilities is warranted.

If you wish to discuss this submission further, please contact Steve Rodgers, Senior Policy Advisor, on 0466 548 519 or at [SRodgers@engineersaustralia.org.au](mailto:SRodgers@engineersaustralia.org.au).

Yours sincerely,

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